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A new herbarium pest.

C. V. RILEY.

In the year 1890 a number of small Geometrid larvæ, recalling somewhat in appearance those of the genus *Aplodes*, were found by the botanists of the Department of Agriculture infesting certain dried plants in the Department herbarium, and especially those which had been received from Mexico and Lower California, from Dr. Edward Palmer. Dr. J. N. Rose first observed it in January, 1890, on plants from La Paz, but it was still more abundant in a collection from the State of Colonna, Mexico, made in the beginning of the present year. Being referred to me for identification, I became much interested in the matter, as it was the first case that had come under my notice of a Geometrid larva feeding upon dried plants. The matter acquired additional interest also because the species was evidently new and there was danger of its being spread through distribution into other parts of the world. I therefore took steps to watch the course of the insect and rear it to the imago state. This was done some time ago and I have had drawings of the different stages finished for some time, and call attention to the matter now because the trouble has grown in the Department herbarium and it is of sufficient importance to put on record. The first moth emerged October 22d, 1890, and others were subsequently reared from material received from time to time from the Department herbarium. While the larva was first discovered, as stated, on Mexican plants, it has not confined its work to such plants, but has spread to others and is by far the most destructive herbarium pest which the botanists in charge have to deal with. Plants of the genus *Coulterella*, for example, which were sent by Dr. Rose to Dr. C. Hoffman in Berlin, have been so injured that but one perfect flower remained; yet, according to the observations of Mr. L. H. Dewey, in overhauling the herbarium, the insect's work is still mostly confined to southwestern plants; after these from Mexico, chiefly those from California. In some cases eastern plants have not been attacked, even when associated with western, but in one case at least, viz.: *Rhus toxicodendron*, eastern plants have been extensively infected.

The larvæ feed on the flowers and also to some extent on the leaves. More rarely they feed on the hard fruits and seeds. The following list, kindly prepared by Mr. Dewey,

of the plants upon which the larvæ had been found prior to its work on *Rhus toxicodendron* will be of interest in this connection.

<i>Species.</i>	<i>Order.</i>	<i>Locality.</i>
<i>Ptelea aptera</i>	Rutaceæ.....	S. California.
<i>Ceanothus sorediatus</i>	Rhamnaceæ.....	S. California.
<i>Dalea Seemanii</i>	Leguminosæ.....	S. California.
<i>Lupinus coccineus</i>	Leguminosæ.....	Arizona.
<i>Purshia tridentata</i>	Rosaceæ.....	Arizona.
<i>Prunus demissa</i>	Rosaceæ.....	S. California.
<i>Ribes viburnifolia</i>	Saxifragaceæ.....	S. California.
<i>Epilobium angustifolium</i> ¹	Onagraceæ.....	E. Massachusetts.
<i>Arctostaphylos oppositifolium</i> ...	Ericaceæ.....	S. California.
<i>Eriodictyon glutinosa</i>	Hydrophyllaceæ.....	Arizona.
<i>Gilia Rusbyi</i>	Polemoniaceæ.....	Arizona.
<i>Pentstemon secundiflorus</i>	Scrophulariaceæ.....	Arizona.
<i>Audibertia Clevelandii</i>	Labiatae.....	S. California.
<i>Dracocephalum parviflorum</i>	Labiatae.....	Arizona.
<i>Salvia ballotæflora</i>	Labiatae.....	Arizona.

The eggs are laid upon the plants or on any surrounding object. They are but slightly attached, bluntly ovoid, 0.3 mm. wide and 0.4 mm. long. They are steel-gray in color, the shell white with faint iridescence when empty, and faintly and irregularly reticulate. The duration of the larval period

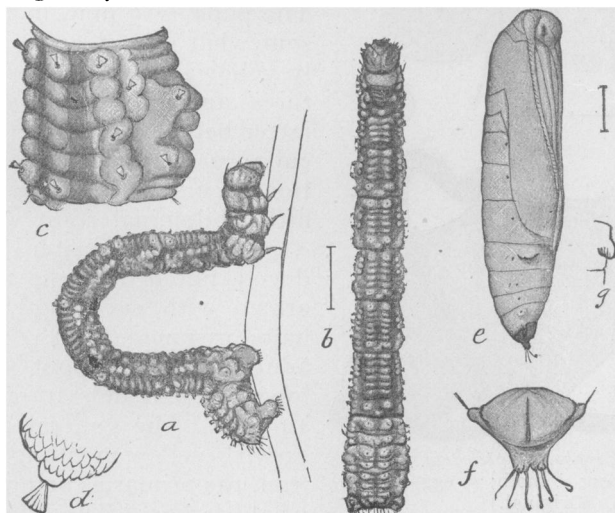


FIG. 1. *Carphoxera ptelearia*: a, larva from side; b, do. from above; c, side view of abdominal joint of same; d, tubercle of same; e, pupa; f, do. cremaster; g, do. abdominal projection.—a, b, d, enlarged about six times; c, d, f, still more enlarged. (Original.)

¹ *E. angustifolium* grows in the West but mostly in northern California and Oregon.

has not been determined. Growth, however, is very slow, and the period from the egg to the full larval growth is variable. The larval life extends in some cases certainly over a period of three months. When full grown the larvæ attain a length, extended, of 8 mm.; contracted when disturbed or at rest of 5 to 6 mm. Whenever disturbed they contract considerably and become rigid and motionless. The larva is shown in characteristic positions in the accompanying illustration (fig. 1, *a*, *b*). It is dull grayish in color, varying considerably in different specimens. On reaching full growth the larva constructs a cocoon of loose white silk, forming an irregular open network as shown in fig. 2, *b*. The cocoon is usually placed in a fold of the leaf or is otherwise protected by the plant, and is occasionally partly covered with bits of anthers or fragments of leaves. In shape it is irregularly ovoid and is about 6 mm. by 3.5 mm. The change to pupa takes place

about three days after the cocoon is completed and the moth usually appears eighteen to twenty days after pupation. The pupa is 5 mm. in length, somewhat robust, and is slightly yellowish in color, with sutures and tip brownish, the latter being quite dark. A peculiar pad or flap-like projection occurs on the side of the fifth abdominal joint (fig. 1, *e*, *g*). The cremaster is produced, notched at the tip and armed with six long hooked hairs or spines (fig. 1, *f*). The adult insect is about 5 mm. long and expands from 13 to 14 mm. The general color is greyish-yellow inclining to saffron, the primaries being somewhat darker. The wings are

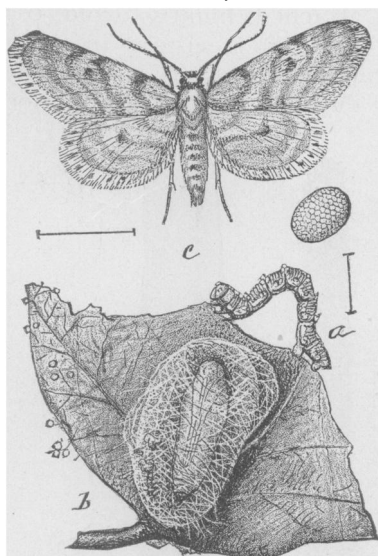


FIG. 2. *Carphoxera ptelearia*: *a*, larva; *b*, cocoon; *c*, moth; *d*, egg—all enlarged. (Original.)

marked (fig. 2, *c*) with transverse bands of dusky shade, and each wing has a discal spot. The head is dark brown, with the antennæ, including a large spot on the vertex, yellowish. The under surface is nearly concolorous, the dark bands being

less distinct, and the discal spot more intensified. The fringes are concolorous with the ground color and with black dots beyond the veins.

This insect has become a source of positive alarm in the Department herbarium on account of its rapid multiplication and the harm it occasions. It behooves botanists to be on the lookout for it and to adopt such measures as will insure immunity from it, if dry specimens are being received from Mexico and the southwest, or from herbaria in which it is known to occur. The custom of poisoning dried plants with corrosive sublimate to protect them from various enemies, such as book mites, Psoci, etc., should give immunity from the attacks of this insect if the poison has been thoroughly applied. If to the corrosive sublimate a quantity of arsenic is added, the protection will be more effectual. I would also recommend as very useful in disinfecting herbaria of this and other pests an air-tight quarantine box of zinc or galvanized iron in which the plants may be temporarily placed and submitted to the fumes of bisulphide of carbon, which are very sure to destroy all insect life. Effective steps have already been taken to prevent the sending out from the Department of any infested specimens in future.

The fact that this insect has appeared in dry plants from the comparatively arid western regions may furnish a clew to its original habit. It is presumable that it normally feeds on the dead or dried plants of Mexico and adjacent arid regions, and that it has simply adapted itself to the somewhat similar conditions prevailing in herbaria.

This is the first true Geometrid, so far as I know, recorded as feeding on dry and dead vegetation. In the Pyralidina a number of species are known to be not only truly carnivorous, feeding on other insects, but also to feed upon grass and rejectamenta as well as dead leaves. Some Tineina are also known to have similar habits, while in the Deltoid group of Noctuids several genera are known to feed on dead leaves.

The illustrations, which have been prepared for *Insect Life*, are used by permission of the Hon. Edwin Willits, Assistant Secretary of Agriculture, who desires to give the facts in the case as wide circulation as possible, and who is particularly anxious that the Department shall not be the means of distributing any undesirable introductions.

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